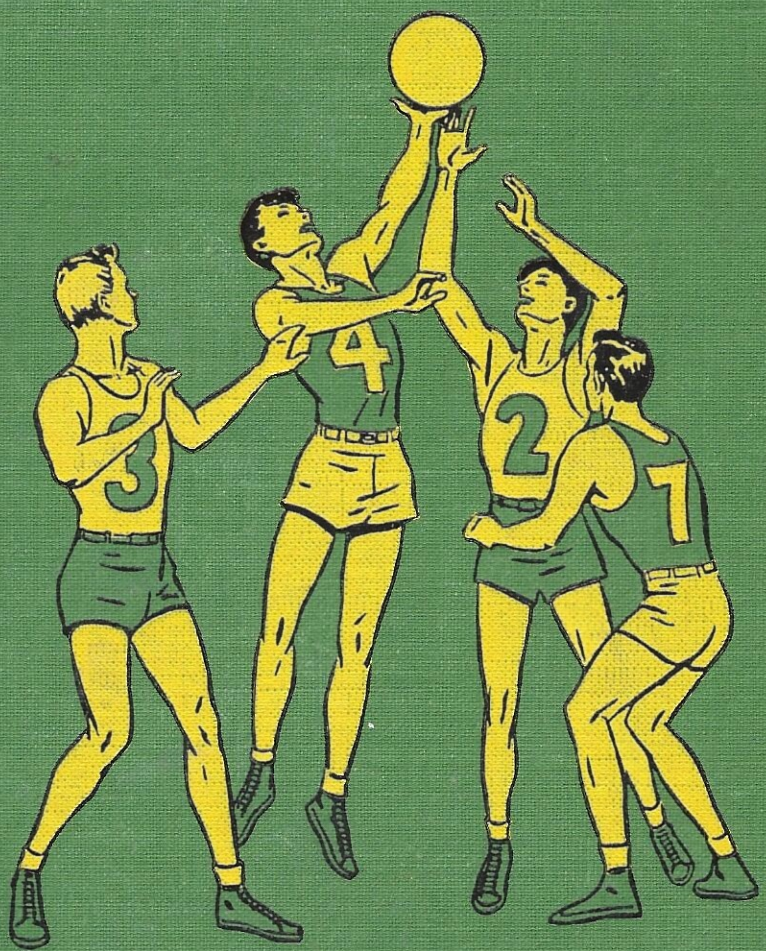
NUMBERS FOR EVERYONE



PATTON • YOUNG

Numbers for Everyone

Numbers at Work Series

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To the Boys and Girls Who Use This Book

Look down the *Road to the Future*. Do you see ahead there where the straight road breaks into several roads, each with a different name?

That is the point where your required school days are over and you choose the rest of the way for yourself.

Life offers each of you many suggestions. Begin now to think in which of these occupations you would find your greatest satisfaction.

Each unit of this book of yours will picture on the first page one of the many possibilities open to you.

If what you want is not given because of lack of space, write for your classmates a word picture of what you see ahead for you.

Press forward, work hard, and have faith in your success.

The Freedom Pledge

I am an American. A free American.

Free to speak — without fear,

Free to worship my own God,

Free to stand for what I think right,

Free to oppose what I believe wrong,

Free to choose those who govern my country.

This heritage of Freedom I pledge to uphold

For myself and all mankind.

Unit 1

Your Country's Calls

Here are the slogans used in some of the patriotic services of our country.

"Join the Navy and See the World." Uncle Sam invites the boys of America to sail the seas and to protect the honor of their homeland throughout the world.

"Uncle Sam Wants You," he says to soldier-minded youths who are proud to be prepared to fight for the Stars and Stripes.

"The Sky's the Limit" is the call to aviation, the call to fly, and fight, if need be, from the air.

"Always Faithful" is the slogan of the Marine Corps whose members protect American lives and property everywhere.

"Always Prepared" well describes the Coast Guard which guards our ports, our equipment, our safety along the full extent of our great coast line.

And the Wacs and the Waves, the Wafs, the Spars, and the Women Marines? Of course! The women who serve our Navy, our Army, our Air Force, who serve as nurses wherever needed, well earn the honor paid to them.

1. Find and discuss in class the book, **Finish High School First.**

2. Report to the class what you know or can learn about the West Point Military Academy and the Annapolis Naval Academy, Uncle Sam's schools.

Hats off to Uncle Sam!

Once More Let's Make Sure

Addition Terms		Subtraction Terms	
75	addend	75	minuend
+23	addend	−23	subtrahend
98	sum	52	remainder or difference

Multiplication Terms		Division Terms	
75	multiplicand	3	quotient
×23	multiplier	divisor 23)75	dividend
225	partial product	69	
150	partial product	6	remainder
1725	product		

1. Write each term, tell to what process it belongs, and define its place in the example given.

2. Read each example and explain exactly how it is worked.

3. Long ago you learned these related facts: $4+5=9$ $5+4=9$ $9-5=4$ $9-4=5$. Use the numbers in the addition example on this page to show four related facts about them.

4. Here are four other related facts: $4\times8=32$ $8\times4=32$ $32\div4=8$ $32\div8=4$. Use the numbers in the multiplication example on this page to show four related facts about them.

5. Add 1768 to 9854. Beside your work explain what you "carried" from each column and why.

6. Subtract 1768 from 9854. Explain how you found each figure in the remainder.

Using the 100 Addition Facts

Add down and check by adding up; or add up, and check by adding down.

	a	b	c	d	e
1.	110	323	154	300	607
	752	263	505	147	760
	637	445	380	924	368
2.	100	390	206	612	840
	801	809	241	980	106
	998	288	761	889	740
3.	1828	3342	7122	2669	6736
	7600	9113	2984	3491	3049
	5558	7624	7297	6659	6995
	3370	925	5708	7323	6171

Surely you remember that in adding money you write the dollars and cents with the decimal points one under the other. The decimal point in the sum is written directly under the other decimal points.

Add and check.

	a	b	c	d
1.	$1.25	$ .96	$ 5.63	$ 100.06
	2.50	1.35	15.74	10.01
	3.75	10.20	35.92	.90
	4.00	3.40	3.94	352.75
	5.10	6.76	97.03	436.25
	6.20	7.25	62.66	47.47
	7.63	.35	2.01	80.82
	.03	50.05	120.50	1512.00

More practice on page 381.

Using the 100 Subtraction Facts

Subtract, and check by adding the remainder to the subtrahend. The sum should equal the minuend.

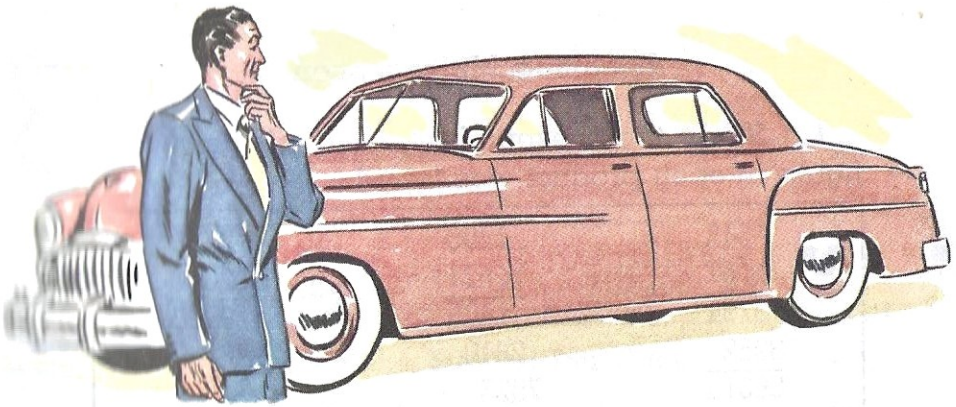
	a	b	c	d	e
1.	10510	18242	16735	16614	12309
	4455	8780	9040	5594	6634
2.	16911	13039	15723	10996	11804
	7214	8189	7140	4748	8165
3.	12268	10003	78480	69539	15907
	2923	5882	40332	3192	9090
4.	14525	87358	13845	95009	18422
	9218	86616	5773	32608	9337
5.	11199	38846	13572	27288	10678
	7620	17164	5651	26729	5495
6.	85583	78431	34442	14681	53093
	70968	39735	26015	5167	23963

When you subtract dollars and cents, you write the decimal points in the minuend, subtrahend, and remainder one under the other.

Subtract and prove.

	a	b	c	d
1.	$422.55	$540.24	$766.47	$8432.18
	238.16	277.62	357.02	2191.45
2.	$729.27	$373.53	$826.73	$695.18
	196.76	286.44	529.38	217.97
3.	$205.89	$787.98	$960.81	$497.50
	5.48	16.49	55.03	1.05

More practice on page 381.



A Wise Buy?

Mr. Potter (In September): Come look at our car. It's a used car, but think what I saved! A new one would cost $2300. I got this for only $1600.

Mr. Potter (In November): What? One hundred dollars for fixing that axle? That's bad.

Mr. Potter (In December): New tires? They'll cost me $104? Well, I must have them.

Mr. Potter (In February): A spring broken? The new one plus work will be $35?

Mr. Potter (In May): Brakes? At $60? A new battery? At $20? Valves fixed? $90?

Mr. Potter (In July): What will you give me for this car? $650? I'll take it.

What did the car cost Mr. Potter in all? Was it a wise buy?

Recalling Multiplication

1. Study these examples. Then tell how each figure in each product was found.

542 ×67 3794 3252 36314	1405 ×521 1405 2810 7025 732005	2789 ×2000 5578000

Using the 100 Multiplication Facts

Multiply, and check by multiplying the multiplier by the multiplicand.

	a	b	c	d	e
1.	8964	5789	2874	9051	4709
	42	30	65	56	98
2.	3571	6325	5804	6457	6935
	75	63	97	81	79
3.	3021	1468	2041	6457	9321
	402	510	731	204	918
4.	4652	9806	2579	6893	243
	602	432	510	809	794

When you multiply dollars and cents by whole numbers, point off two decimal places in the product to show cents.

Multiply.

	a	b	c	d	e
5.	$15.91	$34.26	$72.29	$63.98	$87.32
	501	305	469	578	960

More practice on page 381.

Recalling Short Division

Study these examples. Then, explain how each quotient figure was found.

1130 6)6780	2315 r 1 7)16206

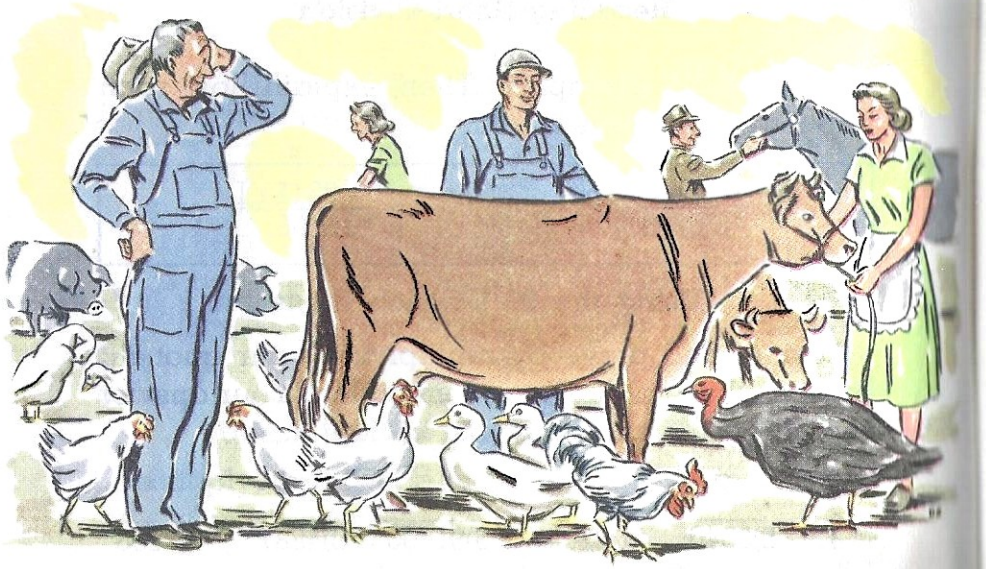
Using the 90 Division Facts

Divide, and prove by multiplying your quotient by your divisor. Add any remainder. Your answer should be the same as your dividend.

	a	b	c	d	e
1.	5)5040	1)82041	3)91803	9)4887	7)7658
2.	8)80784	4)4816	2)9654	1)79653	6)2292
3.	5)5215	2)1806	7)5782	8)13256	4)2120
4.	6)4260	9)8019	6)27654	2)3308	5)38450
5.	3)6144	7)24990	4)2748	8)1944	9)5580
6.	6)45054	5)10255	3)23853	9)6570	4)31604

When you divide dollars and cents by a whole number, point off two decimal places in the quotient to show cents, or place the decimal point in the quotient over the decimal point in the dividend.

7.	5)$50.50	6)$39.00	8)$65.60	9)$83.79	3)$90.36
8.	2)$106.10	4)$87.24	5)$50.45	8)$75.48	6)$38.52
9.	4)$98.64	7)$54.74	6)$56.88	7)$189.07	9)$75.78



One Answer. One Answer Only

Every one start at the same signal. Work your way to the end and see who is first to find the right answer.

Farmer Brown has 3 sons.

He has twice as many daughters as he has sons.

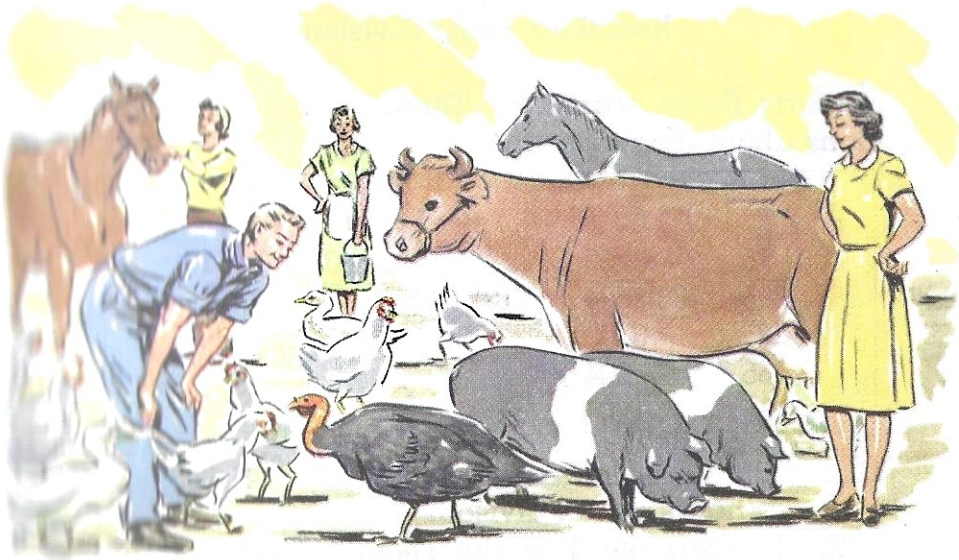
He has 3 times as many cows as he has daughters.

He has twice as many cows as he has horses.

He has 7 times as many ducks as he has horses.

He has twice as many hens as he has ducks.

He has 6 times as many hens as he has turkeys.



He has 3 times as many turkeys as he has pigs.

He has 4 times as many geese as he has pigs.

Each day he gets 3 times as many hens' eggs as he has geese.

He gets 4 times as many hens' eggs each day as he does ducks' eggs.

The number of quarts of milk he gets each day is 5 times the number of ducks' eggs per day.

HOW MANY QUARTS OF MILK DOES FARMER BROWN GET A DAY?

Recalling Long Division

Study these examples. Then, answer the questions about them.

1.	2.	3.	4.
15	53	240 r 30	17
53)795	68)3604	713)171150	500)8500
53	340	1426	
265	204	2855	
265	204	2852	
		30	

1. What is a trial divisor?
2. In Example 1 is the second figure of the divisor 5 or less than 5? Then what is used as the trial divisor?
3. In Example 2, what is the second figure of the divisor? Then what is used as the trial divisor?
4. In Example 1, why is the first quotient figure written over the 9?
5. In Example 2, why is the first quotient figure written over the 0?
6. Explain the 0 in the quotient of Example 3.
7. What happened to the zeros in Example 4?

Divide and prove.

	a	b	c	d
8.	19)10906	54)15390	38)$131.29	92)$217.12
9.	45)41900	79)77736	63)473823	36)292680
10.	124)90520	560)19732	685)56855	785)116180

More practice on page 381.

Look Out for Zeros

Work these examples, and beside your work explain exactly how you used each zero in an example and how you got each zero in an answer.

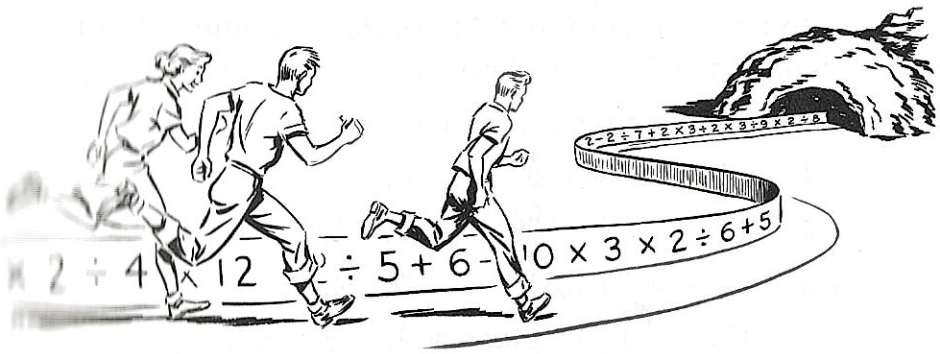
	a	b	c	d
1.	5067	10821	5067	50709
	+3270	+50709	−3240	−10821
2.	1020	1015	6700	9876
	×15	×420	×806	×3000

3. Explain the number of partial products in each of the multiplication examples.

4.	5)4910	8)1608	5)3700	100)76000
5.	20)4705	205)20705	200)6780	99)10000

A Race to the Secret Cave

Follow the signs and see who first reaches the cave.



3 + 2 + 8 − 1 × 2 ÷ 4 × 12 − 2 ÷ 5 + 6 − 10 × 3 × 2 ÷ 6 + 5 + 7 ÷ 2 × 8 ÷ 2 − 2 ÷ 7 + 2 × 3 ÷ 2 × 3 ÷ 9 × 2 ÷ 8 =

TRILLIONS	HUNDRED BILLIONS	TEN BILLIONS	BILLIONS	HUNDRED MILLIONS	TEN MILLIONS	MILLIONS
5	6	5	7	8	4	3

Numbers!

Remember about reading large numbers? Study this two-page chart to recall the place value of each figure in the number given. Then read as one number the figures between the dividing red lines and give that number the value of the last figure. Start "5 trillion, 657 billion," and read to the end.

Read these numbers in the same way.

1. 3,725,686,505,252
2. 1,234,567,892,198
3. 6,954,505,432,510
4. 9,120,212,368,555
5. 2,251,710,349,105
6. 4,398,643,200,542

7. Now tell the place value of each figure in each of the large numbers you have just read.

What comes after trillions? Find out the two or three next higher place values and report their names to the class.

HUNDRED THOUSANDS	TEN THOUSANDS	THOUSANDS	HUNDREDS	TENS	UNITS
3	5	4	7	2	5

You have been told time and again that each place value stands for ten times the value of the place to its right. Did you ever prove this for yourself? Let's do it now.

Say you have 2 units. Multiply the 2 by 10. $10 \times 2 = 20$ or 2 tens. Are the 2 tens worth 10 times as much as the 2 units?

Multiply the 20 by 10. $10 \times 20 = 200$ or 2 hundreds. Are the 2 hundreds worth 10 times as much as the 2 tens?

Multiply.

$10 \times 2 = ?$
$10 \times 20 = ?$
$10 \times 200 = ?$
$10 \times 2000 = ?$
$10 \times 20{,}000 = ?$
$10 \times 200{,}000 = ?$
$10 \times 2{,}000{,}000 = ?$
$10 \times 20{,}000{,}000 = ?$
$10 \times 200{,}000{,}000 = ?$

Are you sure now?

Divide.

$5{,}000{,}000{,}000 \div 10 = ?$
$500{,}000{,}000 \div 10 = ?$
$50{,}000{,}000 \div 10 = ?$
$5{,}000{,}000 \div 10 = ?$
$500{,}000 \div 10 = ?$
$50{,}000 \div 10 = ?$
$5000 \div 10 = ?$
$500 \div 10 = ?$
$50 \div 10 = ?$

Tables to Build

Choose the right facts from the list below and build for yourself the tables of length; of weight; of counting; of time. Then build the tables of liquid measure; of dry measure; of surface measure; and of cubic measure.

Better read the list carefully before writing a table. 36 in.=1 yd. 3 ft.=1 yd. There are other doubles of that sort, too.

Every measure in the list must find its place in a table, you see.

16 oz.=1 lb.
4 qt.=1 gal.
12 things=1 doz.
24 hr.=1 da.
32 qt.=1 bu.
60 sec.=1 min.
12 in.=1 ft.
100 lb.=1 cwt.
12 mo.=1 yr.
160 sq. rd.=1 A.
4 pk.=1 bu.
3 ft.=1 yd.
12 doz.=1 gro.
7 da.=1 wk.
5280 ft.=1 mi.
2 cupfuls=1 pt.
100 yr.=1 century
36 in.=1 yd.

2000 lb.=1 T.
144 sq. in.=1 sq. ft.
365 da.=1 yr.
2 pt.=1 qt.
1 sea mi.=1.152 land mi.
$5\frac{1}{2}$ yd.=1 rd.
640 A.=1 sq. mi.
366 da.=1 leap year
$16\frac{1}{2}$ ft.=1 rd.
8 qt.=1 pk.
60 min.=1 hr.
9 sq. ft.=1 sq. yd.
1728 cu. in.=1 cu. ft.
320 rd.=1 mi.
144 things=1 gross
52 wk.=1 yr.
$30\frac{1}{4}$ sq. yd.=1 sq. rd.
27 cu. ft.=1 cu. yd.

Time Yourself

Time yourself to see how many minutes you need to find the answers asked for.

Remember, first be sure and then be quick.

1. 5 bu.=? pk.=? qt.=? pt.
2. $2\frac{1}{2}$ gal.=? qt.=? pt.=? cupfuls.
3. 3200 oz.=? lb.=? cwt.=what part of a ton?
4. 2 sq. yd.=? sq. ft.=? sq. in.
5. 432 articles=? gro.=? doz.
6. 1 T.=? cwt.=? lb.=? oz.
7. 2 mi.=? rd.=? ft.
8. 256 pt.=? qt.=? pk.=? bu.
9. 3 da.=? hr.=? min.=? sec.
10. 2 A.=? sq. rd.=? sq. yd.
11. 129,600 sec.=? min.=? hr.=? da.
12. 3 wk.=? da.=? hr.=? min.
13. 2 cu. yd.=? cu. ft.=? cu. in.

Work for Others

Choose two of the tables of measures. Make two good problems, each using one of your tables. Give the problems to your teacher to read to the class. See who can be first to get the answers.

More practice on page 381.

A Week's Vacation

"Yes, Jack, you and Polly may go to your cousin's for a week IF."

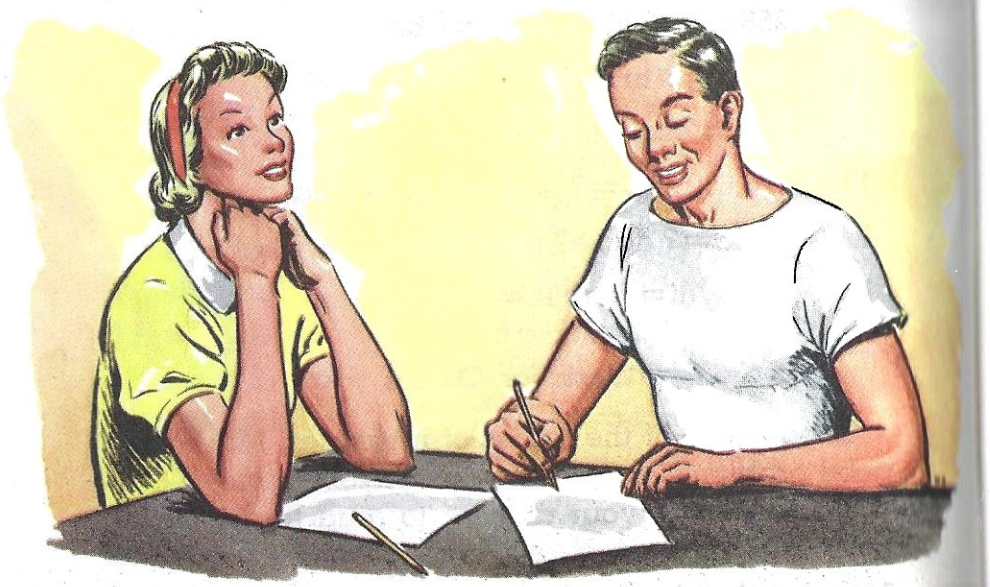
"If what, Dad?"

"If you and Polly will bring me a list of the things for which you need money; how much each thing will cost; and the total amount I must give you."

"Come on, Polly. Let's get to work."

"I need a new bathing suit, and the one I want costs $5.00," said Polly. "Then I need 3 pairs of socks."

"We had better write all this down for Dad," said Jack; and they began to write.



Here is the report as they wrote it.

Polly's needs:		
Bathing suit	$ 5.00	
Socks—3 pr. at 35¢	1.05	
Very full skirt	4.98	
Hat	3.25	
Gift for Aunt Ann	2.50	
		$16.78
Jack's needs:		
Bathing suit	$ 2.75	
Slacks	2.98	
Shoes	13.00	
Box of Candy as gift	1.00	
(you find the sum)		?
Plane fare for 2, 1 way	$20.36	
Return by train for 2	11.40	
		31.76
Cash to spend if necessary	$ 5.00	5.00
Total (you find it)		?

Two rather sad, young folks handed the paper to Dad.

"Dad, we won't go. We had no idea we were asking for so much," they said.

"Yes, you will go," said Dad. "I just thought it would be wise for you both to realize what such trips cost.

"What would you save if you go by train, and I drive over and bring you back in the car? What would your trip cost then?" (Find the answers for Dad.) Pretty fine Dad, isn't he?

Working with Measures

Study these examples and explain how each is worked.

5 lb. 12 oz. +2 lb. 5 oz. 7 lb. 17 oz. or 8 lb. 1 oz.	4 gal. 1 qt. = 3 gal. 5 qt. −2 gal. 3 qt. = 2 gal. 3 qt. 1 gal. 2 qt.
2 yd. 2 ft. 8 in. +1 yd. 1 ft. 6 in. 4 yd. 1 ft. 2 in.	3 pk. 6 qt. 1 pt. ×3 9 pk. 18 qt. 3 pt. or 11 pk. 3 qt. 1 pt.
1 wk. 6 da. 3)5 wk. 4 da.	2 A. 15 sq. rd. 15)31 A. 65 sq. rd.

Find the answers.

1. 7 gro. 8 doz.
+3 gro. 9 doz.

2. 14 hr. 17 min.
−9 hr. 21 min.

3. Multiply 5 yd. 2 ft. by 17.

4. Multiply 1 sq. ft. 12 sq. in. by 24.

5. Divide 35 lb. 12 oz. by 8.

6. Divide 2 da. 16 hr. by 12.

7. The distance around a square field is 6 yd. 2 ft. What is the length of each side?

8. In putting up molding in a room, Bert used 4 pieces of molding each 15′3″ long. How many feet and inches of molding did he use?

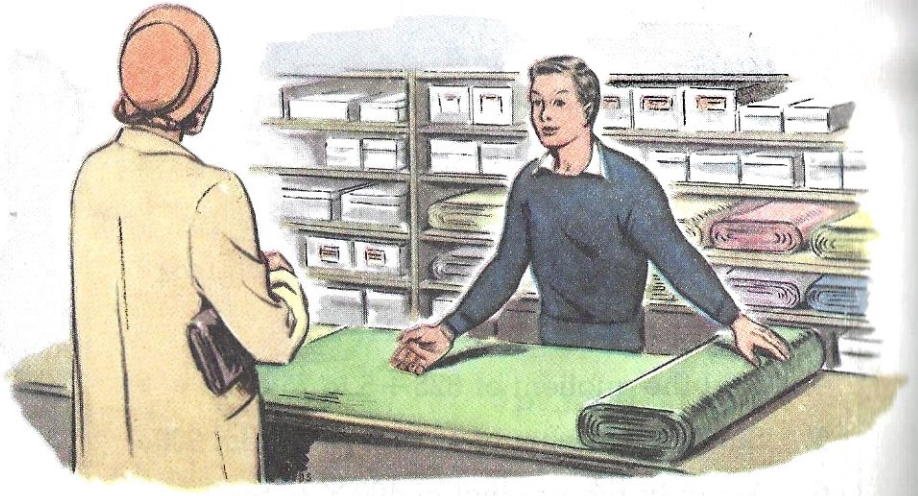
9. How many hours and minutes are there between 8:45 A.M. and 12 M.? Between 1:30 P.M. and 6:15 P.M.?

More practice on page 382.

Good Practice

Use pencils only if necessary.

1. Multiply the quotient of 189 ÷ 9 by 10.
2. Add the remainder of 2401 − 1300 to 304.
3. Divide the sum of 250 + 119 by 9.
4. Add the quotient of 625 ÷ 5 to 75.
5. Subtract the sum of 165 + 54 + 6 from 300.
6. Multiply the product of 100 × 36 by 3.
7. Divide the remainder of 2078 − 278 by 9.
8. Add the quotient of 560 ÷ 10 to 64.
9. Multiply the sum of 138 + 8 + 9 by 100.
10. Subtract the product of 2 × 136 from 300.
11. Divide the quotient of 2828 ÷ 7 by 4.
12. Subtract the remainder of 3456 − 1234 from 3444.
13. Multiply the sum of 43 + 26 + 12 by 1000.
14. Divide the product of 100 × 81 by 90.
15. Subtract the quotient of 864 ÷ 8 from 510.
16. Add the product of 1000 × 25 to 999.
17. Subtract the sum of 16 + 116 + 5 from 396.
18. Multiply the remainder of 6370 − 80 by 10.
19. Add the quotient of 6500 ÷ 100 to 45.
20. Divide the product of 9 × 709 by 3.



Dan in Charge

Mother: Dan, both your father and I are driving to town to buy goods. Could you tend the store alone and keep track of what you sell?

Dan: Of course, Mother, I'd like that. Never had the store alone before.

Dan: You want 13 yards of this cloth, Mrs. Bell? Here you are. I gave you 6 inches over for good measure. The price is 98¢ a yard. (What did the sales slip show as the cost of 13 yards at 98¢ a yard?) You have given me two $10.00 bills. Here is your change. (How much was the change?)

There, she's gone. Now, let's see. The label on the goods said there were 29 yd. 15 in. I sold 13 yards and allowed 6 inches. What should I make the label show now? (State what Dan should put down on the label.)

Good morning, Mr. Hogan. What can I sell you? Fifteen pencils? They are priced at 5¢ each or 50¢ a dozen. Let's see. I will charge you for a dozen at the dozen rate, and 5¢ each for the extras. (That was how much in all? How much did Mr. Hogan save because of the dozen rate?)

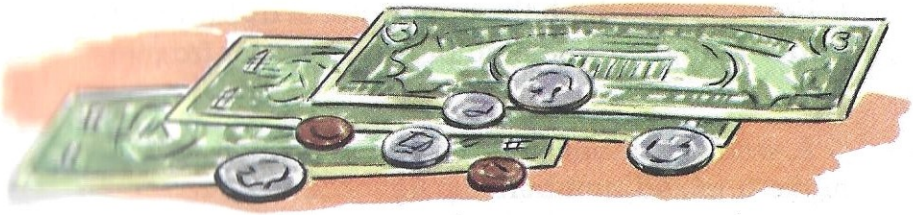
Hello, Mary. What can I do for you? Socks? Look at these. I think they are very cute. Then you would like some of them? Good. Now see here. They are marked 35¢ a pair, but I heard Dad say he would put them on sale tomorrow at 3 pairs for a dollar. You'll take 3 pairs? Here they are, and I'm glad you will be wearing them. (How much did Mary save by buying at the new price? Wasn't much of a bargain, was it?)

1. Find out how much money Dan took in that day.

2. If the dress goods had cost Dan's father 75¢ a yard, how much did he make on Mrs. Bell's purchase?

3. What did he make on the pencils if he paid 36¢ a dozen?

4. What did he gain on the socks sale if they cost him 23¢ a pair?



Recalling Fractions

If you cut a whole thing into three pieces of equal size, each piece would be a part or a fraction of the whole. Each piece would be 1 of 3 pieces, or $\frac{1}{3}$ of the whole.

The number below the line of the fraction shows into how many pieces the whole has been divided. The number below the line is called the **denominator** of the fraction.

The number above the line shows how many of the parts have been taken. The number above the line is called the **numerator** of the fraction.

If you take 2 of the 3 equal parts, your fraction would be $\frac{2}{3}$. Would $\frac{3}{3}$ equal the whole?

A fraction can be used to show one or more of the equal parts of a **group of things.** To find $\frac{3}{4}$ of 12 oranges, you would divide 12 by 4 to find $\frac{1}{4}$, and multiply the answer by 3 to find $\frac{3}{4}$.

$12 \div 4 = 3 = \frac{1}{4}$ of 12 $\qquad$ $3 \times 3 = 9 = \frac{3}{4}$ of 12

Fractions in which the numerator is smaller than the denominator are **proper fractions.** $\frac{1}{4}, \frac{2}{5}, \frac{7}{8}$.

Fractions in which the numerator is as large as or larger than the denominator are **improper fractions.** $\frac{7}{7}, \frac{9}{5}, \frac{8}{3}$.

A whole number and a fraction written together make a **mixed number.** $5\frac{1}{3}, 6\frac{1}{5}$.

Changing Fractions

The numbers in the fraction $\frac{4}{8}$ are larger than the numbers in the fraction $\frac{1}{2}$, so we say $\frac{4}{8}$ is in **higher terms** than $\frac{1}{2}$, and $\frac{1}{2}$ is in **lower terms** than $\frac{4}{8}$.

To change a fraction to **higher terms, multiply** both terms of the fraction by the same number. Multiply both terms of $\frac{1}{2}$ by 4. $\frac{4 \times 1}{4 \times 2} = \frac{4}{8}$

To change a fraction to **lower terms, divide** both terms of the fraction by the same number. $\frac{4 \div 2}{8 \div 2} = \frac{2}{4}$

To reduce a fraction to **lowest terms,** divide both terms of the fraction by the largest number which will exactly divide both terms. $\frac{4 \div 4}{8 \div 4} = \frac{1}{2}$

Change to higher terms.

$\frac{3}{4} = \frac{?}{8}$ $\qquad$ $\frac{6}{7} = \frac{?}{14}$ $\qquad$ $\frac{1}{3} = \frac{?}{9}$ $\qquad$ $\frac{2}{5} = \frac{?}{15}$

Change to lowest terms.

$\frac{8}{12}$ $\qquad$ $\frac{15}{75}$ $\qquad$ $\frac{35}{70}$ $\qquad$ $\frac{9}{27}$ $\qquad$ $\frac{12}{48}$ $\qquad$ $\frac{20}{80}$ $\qquad$ $\frac{12}{18}$

Study these examples and explain what has been done and how it was done.

$\frac{18}{6} = 18 \div 6 = 3$	$5\frac{2}{3} = 3 \times 5 + 2 = \frac{17}{3}$
$\frac{21}{6} = 21 \div 6 = 3\frac{3}{6} = 3\frac{1}{2}$	$8 = \frac{?}{4} = 4 \times 8 = \frac{32}{4}$

Change to whole or mixed numbers: $\frac{18}{4}, \frac{24}{8}, \frac{46}{9}$

Change to improper fractions: $8\frac{3}{5}, 6\frac{1}{4}, 9\frac{2}{3}$.

Change to improper fractions: $9 = \frac{?}{2}, 7 = \frac{?}{3}, 8 = \frac{?}{6}$.

The Last Warm Day of Fall!

Supply all the missing numbers

"Oh, Margaret, can't we have one more picnic this fall?" asked Dick.

"Yes, if you will all help. There will be 11 of your crowd, and I will go along to keep the peace," said Dick's sister, Margaret.

"We will need 48 sandwiches. I'll make $\frac{1}{3}$ of them if Lucy and Betty will make the rest."

"Let's see," said Dick. "One third of them will be 48 divided by 3. So you will make (?) sandwiches, and Lucy and Betty's $\frac{2}{3}$ will be (?). What next?"

"I will buy 3 packages of frankfurters. They cost 70¢ a package. If 5 of you boys pay for the sausage, each will pay one (?) of the cost. That will be (?) cents.

"The 4 other members of the crowd can bring 24 cookies. Each one's share will be one (?) or (?) cookies."

Hurrah, the day for the picnic has come! Everyone is on hand. Let's eat!

Working with Like Fractions

Of course, you know that fractions with the same denominator are **like fractions.** They have the same denominator called a **common denominator.** Study these examples and explain the steps taken.

$\frac{1}{6}+\frac{5}{6}=\frac{6}{6}=1$
$\frac{1}{9}+\frac{2}{9}+\frac{5}{9}=\frac{8}{9}$
$\frac{2}{7}+\frac{3}{7}+\frac{4}{7}=\frac{9}{7}=1\frac{2}{7}$

$\frac{10}{11}+\frac{3}{11}=\frac{13}{11}=1\frac{2}{11}$
$\frac{7}{8}+\frac{1}{8}=\frac{8}{8}=1$
$\frac{15}{6}+\frac{5}{6}=\frac{20}{6}=3\frac{2}{6}=3\frac{1}{3}$

Add.

	a	b	c
1.	$\frac{1}{8}+\frac{2}{8}+\frac{3}{8}$	$\frac{1}{5}+\frac{2}{5}+\frac{3}{5}$	$\frac{7}{12}+\frac{5}{12}+\frac{1}{12}$

Study these subtraction examples and explain the steps taken.

$\frac{8}{9}-\frac{4}{9}=\frac{4}{9}$ $\quad \frac{5}{8}-\frac{1}{8}=\frac{4}{8}=\frac{1}{2}$ $\quad \frac{5}{6}-\frac{1}{6}=\frac{4}{6}=\frac{2}{3}$

Subtract.

2. $\frac{7}{8}-\frac{3}{8}$ $\quad \frac{7}{12}-\frac{3}{12}$ $\quad 1\frac{3}{16}-\frac{5}{16}$

Study and explain.

$$\begin{array}{r} 2\frac{3}{7} \\ +1\frac{4}{7} \\ \hline 3\frac{7}{7}=4 \end{array} \qquad \begin{array}{r} 5\frac{2}{5} \\ +6\frac{4}{5} \\ \hline 11\frac{6}{5}=12\frac{1}{5} \end{array} \qquad \begin{array}{r} 5\frac{5}{6} \\ -2\frac{3}{6} \\ \hline 3\frac{2}{6}=3\frac{1}{3} \end{array} \qquad \begin{array}{r} 8 \;=7\frac{4}{4} \\ -3\frac{3}{4}=3\frac{3}{4} \\ \hline 4\frac{1}{4} \end{array}$$

Follow the signs.

3. $6\frac{7}{8}+5\frac{1}{8}$ $\quad 8\frac{1}{3}-4\frac{2}{3}$ $\quad 7\frac{3}{5}+3\frac{3}{5}$
4. $3\frac{1}{3}+2\frac{1}{3}+4\frac{1}{3}$ $\quad 6\frac{3}{8}-4\frac{5}{8}$ $\quad 9-1\frac{7}{8}$

Working with Unlike Fractions

Unlike fractions do not have the same denominator. $\frac{2}{3}$ and $\frac{1}{2}$ are unlike fractions.

Should you wish to add $\frac{2}{3}$ and $\frac{1}{2}$, you would need to make them into like fractions having the lowest or least **common denominator.**

How do you find the least common denominator? Study these four addition examples.

$\frac{1}{4}=\frac{1}{4}$
$\frac{1}{8}=\frac{1}{8}$
$\frac{3}{8}$

One denominator may be used as the least common denominator.

1.

$\frac{2}{3}=\frac{4}{6}$
$\frac{1}{2}=\frac{3}{6}$
$\frac{7}{6}=1\frac{1}{6}$

One denominator multiplied by the other may give the least common denominator.

2.

$\frac{1}{4}=\frac{3}{12}$
$1\frac{1}{4}=1\frac{3}{12}$
$2\frac{1}{4}=2\frac{3}{12}$
$3\frac{9}{12}$
$3\frac{9}{12}=3\frac{3}{4}$

The least common denominator may be found by multiplying the largest denominator by 2.

3.

$2\frac{1}{3}=2\frac{4}{12}$
$1\frac{1}{2}=1\frac{6}{12}$
$\frac{3}{4}=\frac{9}{12}$
$3\frac{9}{12}$
$3\frac{9}{12}=4\frac{7}{12}$

If twice the largest denominator is not a common denominator, multiply this denominator by 3 or even 4.

4.

Add.

1.	$\frac{2}{3}+\frac{1}{6}$	$\frac{1}{3}+\frac{1}{12}$	$\frac{1}{2}+\frac{2}{3}+\frac{1}{6}$
2.	$\frac{1}{2}+\frac{3}{5}$	$\frac{3}{4}+\frac{2}{3}$	$\frac{2}{3}+\frac{1}{2}+\frac{1}{4}$
3.	$\frac{4}{5}+\frac{2}{3}$	$\frac{5}{6}+\frac{3}{8}$	$\frac{5}{6}+\frac{7}{10}+\frac{1}{3}$
4.	$\frac{1}{6}+\frac{3}{4}$	$\frac{2}{7}+\frac{1}{2}$	$\frac{4}{9}+\frac{1}{2}+\frac{2}{3}$

Make Sure You Know

If you can add unlike fractions, you can subtract unlike fractions and mixed numbers.

Add.

	a	b	c	d	e
1.	$\frac{1}{2}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{8}$	$\frac{1}{3}$ $\frac{1}{2}$	$\frac{3}{5}$ $\frac{3}{7}$	$\frac{1}{3}$ $\frac{1}{4}$
2.	$\frac{1}{4}$ $\frac{1}{6}$	$\frac{1}{6}$ $\frac{3}{8}$	$\frac{5}{6}$ $\frac{1}{9}$	$2\frac{2}{3}$ $3\frac{5}{9}$	$1\frac{3}{5}$ $2\frac{2}{9}$

Subtract.

3.	$\frac{1}{2}$ $\frac{1}{4}$	$\frac{1}{2}$ $\frac{1}{3}$	$\frac{3}{4}$ $\frac{1}{3}$	$\frac{8}{9}$ $\frac{3}{5}$	$\frac{8}{9}$ $\frac{5}{6}$
4.	$8\frac{1}{2}$ $4\frac{1}{4}$	$7\frac{2}{3}$ $3\frac{1}{2}$	$10 = 9\frac{8}{8}$ $1\frac{5}{8} = 1\frac{5}{8}$		9 $2\frac{2}{3}$
5.	8 $5\frac{3}{8}$	$9\frac{5}{12}$ $\frac{1}{8}$	$9\frac{1}{2}$ $3\frac{1}{6}$	$6\frac{3}{4}$ $4\frac{3}{5}$	$7\frac{5}{6}$ $4\frac{2}{3}$

Now study this example and explain what each step means.

$$8\tfrac{1}{8} = 8\tfrac{1}{8} = 7\tfrac{9}{8}$$
$$7\tfrac{1}{4} = 7\tfrac{2}{8} = 7\tfrac{2}{8}$$
$$\tfrac{7}{8}$$

Subtract.

6.	$9\frac{1}{6}$ $3\frac{1}{2}$	$9\frac{3}{5}$ $4\frac{3}{4}$	$8\frac{1}{6}$ $2\frac{2}{3}$	$9\frac{5}{12}$ $\frac{7}{8}$	$6\frac{4}{9}$ $3\frac{5}{6}$

Thinking with Fractions

Suppose you discovered that 12 cocoanut candies weigh $\frac{3}{5}$ of a pound. How many would you expect to find in a pound?

If $12 = \frac{3}{5}$, $\frac{1}{5} = 12 \div 3 = 4$.

If $4 = \frac{1}{5}$, $\frac{5}{5} = 5 \times 4 = 20$.

1. 15 is $\frac{3}{5}$ of ? 24 is $\frac{4}{5}$ of ? 18 is $\frac{6}{7}$ of ?
2. 80 is $\frac{4}{5}$ of ? 10 is $\frac{2}{3}$ of ? 25 is $\frac{5}{8}$ of ?

If your 12 cocoanut candies cost 72¢, what would 20 of them cost?

If 12 cost 72¢, 1 costs $72¢ \div 12 = 6¢$.

If 1 costs 6¢, 20 will cost $20 \times 6¢ = \$1.20$.

Find the cost of:

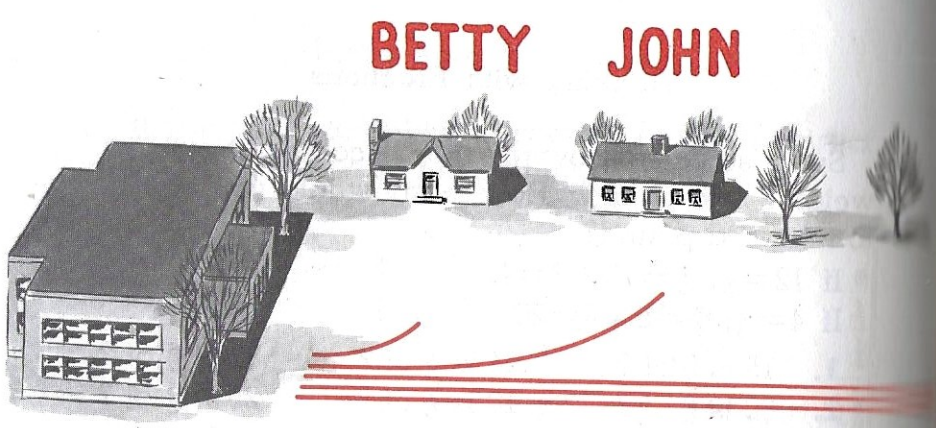
3. 8 pencils at 96¢ a doz.
4. 10 oz. of beef at \$1.12 a lb.
5. 9 cookies at 60¢ a dozen.
6. 12 qt. of peas at \$1.60 a bu.

Suppose you have a dollar, and spend \$.20 of it. What fraction of the dollar have you spent? You have spent $\frac{20}{100}$ of your dollar and $\frac{20}{100} = \frac{1}{5}$.

7. 15 is what part of 75?
8. 12 is what part of 108?

Suppose you wanted to know the relation or ratio between the part of your dollar spent and the whole dollar. The ration is 20¢ to 100¢, or $\frac{20}{100}$ of your dollar.

9. What is the ratio of 3 to 7? Of 7 to 3? Of 15 to 40? Of 1,000,000 to 3,000,000?



Down Milton Avenue

Bob, Betty, John, Bill, and Alice all live on the same street and walk home from school together.

1. Bill lives $\frac{1}{2}$ mile from school. How many feet does he walk to get home?

2. Betty lives only $\frac{1}{10}$ as far from school as Bill does. That is how many feet? How much farther does Bill walk than Betty?

3. John lives $\frac{1}{5}$ of the distance from school to Bill's house. How many more feet does he walk than Betty does? How many less than Bill?

4. Bob's house is $\frac{3}{5}$ of the way to Bill's. How many feet does Bob walk? How much farther does he walk than Betty does?

5. Alice lives $\frac{9}{10}$ of the distance to Bill's house. How far do Alice and Bill walk together after they have left Bob?

6. Add the number of feet the different boys and girls walk. Then add the fractions of a mile. See if the number of feet in a mile multiplied by the sum of the fractions equals the total number of feet walked.

7. Divide the total final number of feet walked by the number of feet in a mile to find out how many miles altogether the five young people walk.

Multiplying Fractions

In multiplying fractions, we multiply the numerators together for a new numerator and the denominators together for a new denominator. Remember?

We **cancel** when we can. That is, we divide a numerator and a denominator by the same number before we multiply.

We work like this:

$\frac{1}{\cancel{2}}\times\frac{5}{\cancel{9}_{3}}=\frac{5}{24}$

$\frac{\cancel{6}^{1}}{\cancel{15}_{3}}\times\frac{\cancel{5}^{1}}{\cancel{24}_{4}}=\frac{1}{12}$

$12\times\frac{3}{5}=\frac{36}{5}=7\frac{1}{5}$

$3\frac{1}{3}\times4\frac{1}{2}=\frac{\cancel{10}^{5}}{\cancel{3}_{1}}\times\frac{\cancel{9}^{3}}{\cancel{2}_{1}}=15$

$\frac{1}{3}\times\frac{\cancel{4}^{1}}{\cancel{8}_{1}}\times\frac{\cancel{5}^{1}}{\cancel{5}_{2}}=\frac{1}{6}$

$\frac{2}{3}\times\frac{1}{5}\times\frac{2}{3}=\frac{4}{45}$

$\frac{\cancel{4}^{1}}{\cancel{1}}\times\frac{3}{\cancel{2}_{2}}=\frac{3}{2}=1\frac{1}{2}$

$34\quad(34\times\frac{1}{2}=17)$

$8\frac{1}{2}$

17

272

289

Multiply.

1. $\frac{2}{3}\times\frac{3}{4}\times\frac{3}{5}$ $\quad\frac{1}{2}\times\frac{6}{15}\times\frac{5}{9}$ $\quad\frac{5}{8}\times\frac{2}{5}\times\frac{1}{8}$
2. $\frac{5}{8}\times\frac{2}{3}$ $\quad\frac{6}{7}\times\frac{1}{2}$ $\quad\frac{3}{7}\times\frac{5}{9}$ $\quad15\times\frac{2}{3}$ $\quad8\times\frac{1}{3}$
3. $5\frac{1}{3}\times\frac{7}{8}\times\frac{3}{24}$ $\quad6\frac{1}{3}\times\frac{2}{5}\times\frac{7}{9}$ $\quad\frac{4}{9}\times\frac{3}{4}\times2\frac{1}{4}$
4. $\begin{array}{r}76\\ 9\frac{3}{4}\\ \hline\end{array}$ $\quad\begin{array}{r}55\\ 7\frac{3}{5}\\ \hline\end{array}$ $\quad\begin{array}{r}120\\ 12\frac{2}{3}\\ \hline\end{array}$ $\quad\begin{array}{r}920\\ 5\frac{3}{10}\\ \hline\end{array}$

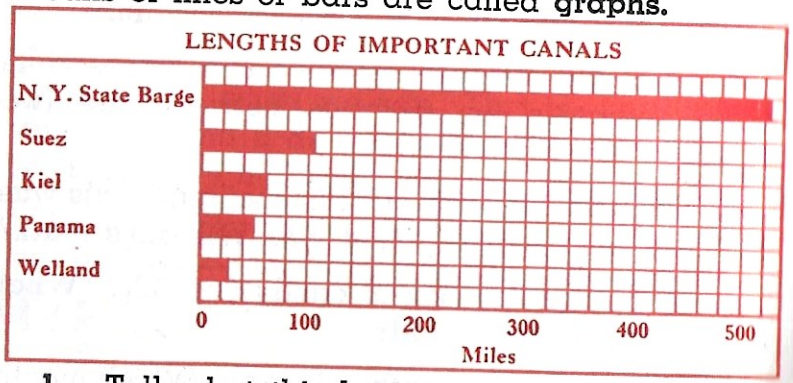
Everyday Uses of Fractions

1. $\frac{5}{6}$ of a number is 15; what is the number?
2. $\frac{3}{4}$ of a number is 9; what is the number?
3. $\frac{5}{8}$ of the distance between two places is 45 miles. What is the distance between the two places?
4. John had a mark of 72 in spelling. This was $\frac{4}{5}$ of William's mark. What was William's mark?
5. $\frac{7}{8}$ of a pound box of candy cost 42¢. What is the price by the pound?
6. $\frac{1}{7}$ of a certain month is 16 days. Which month is it?
7. What is $\frac{2}{3}$ of 24?
8. When butter is selling at 96¢ a pound, what will $\frac{7}{8}$ of a pound cost?
9. When candy is selling at 80¢ a pound, what part of a pound will 10¢ buy?
10. What part of a $1.00 pie will 15¢ buy?
11. When ribbon is selling at 32¢ a yard, what part of a yard will 12¢ buy?
12. When bananas are selling at 24¢ a dozen, what part of a dozen will 20¢ buy?
13. If oranges cost 40¢ a dozen, what part of a dozen will 10¢ buy?
14. At $20 a ton, what part of a ton of coal will $4 buy?

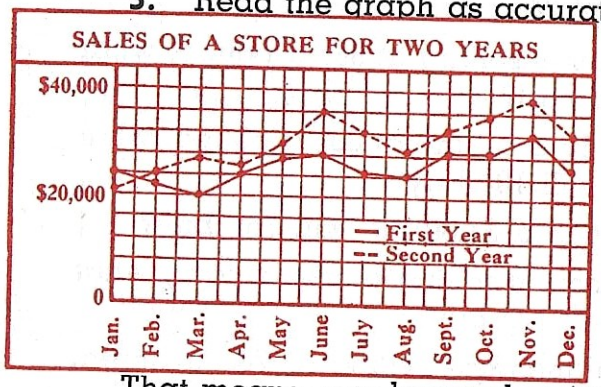
More practice on page 383.

Bar Graphs and Line Graphs

Charts on which numbers are compared by means of lines or bars are called **graphs.**



1. Tell what this **horizontal bar graph** shows.
2. For how many miles does each square stand?
3. Read the graph as accurately as you can.



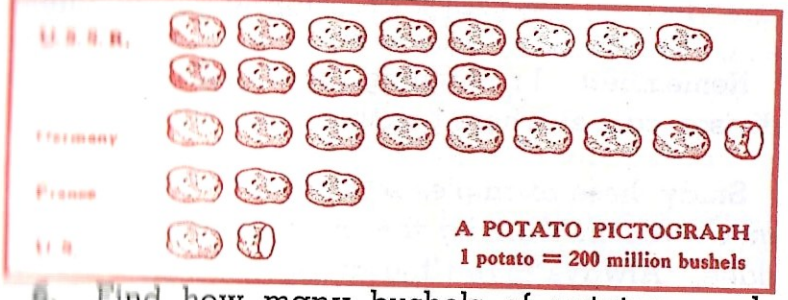
In this **double-line graph,** sales figures for two succeeding years are compared, with the amounts rounded to the nearest thousand.

That means, you know, that $500 or over counts as $1000.

4. For how many dollars does each vertical space stand?
5. About what were the total sales for each year?

Pictographs

Pictographs compare numbers by means of pictures. This pictograph compares the potato crops of four leading potato-producing countries in a recent year.



6. Find how many bushels of potatoes each raised.

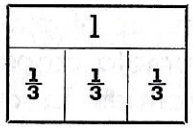
Making Graphs

Use squared paper in building bar and line graphs. Base your scale on the largest number to be represented. If the number is 246, each square could stand for 8, and 246 would be represented by $30\frac{3}{4}$ squares. Why? Before comparing large numbers, round them to the nearest hundred, thousand, or ten-thousand.

1. Recently there were 227,244 mi. of railways in the United States; 57,487 mi. in Soviet Russia; 13,572 mi. in Japan. Show these facts in a bar graph.
2. Three states produced these amounts of maple syrup in a recent year: Vermont, 889,000 gal.; New York, 740,000 gal.; Ohio, 340,000 gal. Show these facts in a pictograph.

More practice on page 384.

Dividing Fractions



When you divide a whole into thirds, do you have 3 times as many thirds as you had wholes?

$1 \div \frac{1}{3} = 1 \times \frac{3}{1} = 3$ thirds

Remember: In dividing fractions, invert the divisor, cancel where possible, and multiply.

Study these examples so carefully that they will guide you in working the other examples on the page. Always invert the divisor.

$\frac{5}{8} \div \frac{3}{4} = \frac{5}{\cancel{8}_{2}} \times \frac{\overset{1}{\cancel{4}}}{3} = \frac{5}{6}$

$15 \div 2\frac{1}{4} = 15 \div \frac{9}{4} = \frac{\overset{5}{\cancel{15}}}{1} \times \frac{4}{\cancel{9}_{3}} = \frac{20}{3} = 6\frac{2}{3}$

$2\frac{1}{4} \div 15 = \frac{9}{4} \div \frac{15}{1} = \frac{\overset{3}{\cancel{9}}}{4} \times \frac{1}{\cancel{15}_{5}} = \frac{3}{20}$

Divide.

	a	b	c	d
1.	$\frac{3}{4} \div \frac{1}{2}$	$\frac{1}{8} \div \frac{3}{4}$	$\frac{5}{6} \div \frac{5}{8}$	$\frac{6}{7} \div \frac{8}{9}$
2.	$\frac{4}{5} \div 8$	$18 \div 2\frac{1}{4}$	$30 \div 6\frac{2}{3}$	$\frac{3}{5} \div 9$
3.	$2\frac{1}{2} \div \frac{5}{8}$	$5\frac{2}{6} \div \frac{2}{9}$	$\frac{9}{10} \div 2\frac{1}{4}$	$24 \div 7$
4.	$4\frac{2}{5} \div 1\frac{1}{9}$	$8\frac{4}{5} \div 2\frac{2}{3}$	$7\frac{1}{5} \div 2\frac{2}{5}$	$5\frac{4}{7} \div \frac{3}{4}$
5.	$6\frac{1}{3} \div 3\frac{7}{8}$	$9\frac{3}{5} \div 6\frac{2}{5}$	$\frac{5}{12} \div 4\frac{5}{9}$	$\frac{7}{16} \div \frac{7}{8}$

Working with Fractions

You have had this example: If 12 candies weigh $\frac{3}{5}$ of a pound, how many equal a pound?

To find out, you divided 12 by 3 to find $\frac{1}{5}$, and multiplied by 5 to find $\frac{5}{5}$. That was perfectly correct. But here is another way to work that same example: Divide 12 by $\frac{3}{5}$.

$12 \div \frac{3}{5} = \frac{\overset{4}{\cancel{12}}}{1} \times \frac{5}{\cancel{3}_{1}} = 20$

Do you see that this way, too, you divided 12 by 3 and multiplied by 5? The answer either way is 20.

How Well Can You Work?

Add.

	a	b	c
1.	$\frac{3}{8} + \frac{1}{4}$	$\frac{4}{5} + \frac{2}{3}$	$\frac{3}{4} + \frac{5}{6}$
2.	$4\frac{1}{2} + 2\frac{5}{6} + 3\frac{2}{3}$	$2\frac{5}{6} + 4\frac{1}{3} + 9\frac{1}{4}$	$5\frac{7}{10} + 1\frac{1}{4} + 6\frac{3}{5}$

Subtract.

3.	$\frac{5}{8} - \frac{1}{3}$	$16 - \frac{9}{10}$	$\frac{3}{8} - \frac{1}{6}$
4.	$12\frac{9}{20} - 8\frac{4}{5}$	$72\frac{1}{4} - 51\frac{2}{3}$	$35\frac{11}{15} - 8\frac{17}{20}$

Multiply.

5.	$42 \times \frac{7}{8}$	$\frac{9}{16} \times 72$	$7\frac{1}{4} \times 432$
6.	$\frac{5}{8} \times \frac{14}{25} \times \frac{6}{7}$	$\frac{8}{9} \times \frac{2}{3} \times 1\frac{3}{4}$	$7\frac{1}{2} \times 8\frac{3}{4} \times 3\frac{1}{5}$

Divide.

7.	$18 \div \frac{3}{4}$	$\frac{9}{10} \div 6$	$\frac{3}{5} \div \frac{8}{15}$
8.	$17\frac{1}{2} \div 5\frac{5}{6}$	$6\frac{2}{3} \div 3\frac{3}{4}$	$5\frac{1}{3} \div 2\frac{4}{5}$

More practice on page 384.

Wise and Unwise Buying

Grandmother came to visit and gave Steve and Sally each $10, saying they could spend it as they liked.

Sally took her friend, Kate, downtown with her. First, they had ice cream sundaes at 35¢ each.

Then Sally bought a rather small cotton sweater for $1.79. Next, both girls saw a good movie, which cost Sally 88¢.

After Kate went home, Sally saw and bought a pretty dress marked down from $10.25 to $6.50.

How much did Sally have left of her $10?

Steve studied the ads in the papers, and found the best values were offered at Ames. He went there and bought a pair of slacks for $5.75, and 4 shirts at $1.97 each.

What did he spend and what did he have left?

Have a class discussion about the amounts spent by both Sally and Steve. Decide which showed the better judgment, and discuss what appealing quality Sally showed, and the value of that quality.

Would you have saved part of your money if you had been in Sally and Steve's place? Why?

Attention, Please!

Here is a table you have seen before. Review it carefully and thoughtfully.

2 will exactly divide any even number.
5 will exactly divide any number that ends in 5 or 0.
10 will exactly divide any number that ends in 0.
3 will exactly divide a number if the sum of its figures can be exactly divided by 3. The sum of the figures in the number 723 is 12. 7+2+3=12. 12÷3=4. 723÷3=241.
6 will exactly divide any even number that 3 will exactly divide.
4 will exactly divide a number if the last two figures of the number are exactly divisible by 4. In the number 2564, 64÷4=16. 2564÷4=641.
8 will exactly divide a number if the last three figures are exactly divisible by 8.
9 will exactly divide a number if the sum of its figures can be exactly divided by 9.

On your paper, write in a line the figures, 2, 3, 4, 5, 6, 8, 9, 10. Cover the table. Then test yourself in placing each of these numbers under the figures which will divide it evenly. Some numbers will go under two or three figures.

26	125	78	400	328	672
232	140	624	333	648	723
2764	1824	3429	1648	8118	9112

Thinking About Problems

Before you try to work any problem, read it carefully to be sure you understand it; then follow this plan:

1. **Find what the problem tells.**
2. **Find what the problem asks for.**
3. **Decide what process or processes should be used and in what order.**
4. **Estimate about what the answer should be.**
5. **Solve the problem.**
6. **Check your answer with your estimate to see if it is reasonable.**
7. **Check your work to be sure you made no mistakes.**

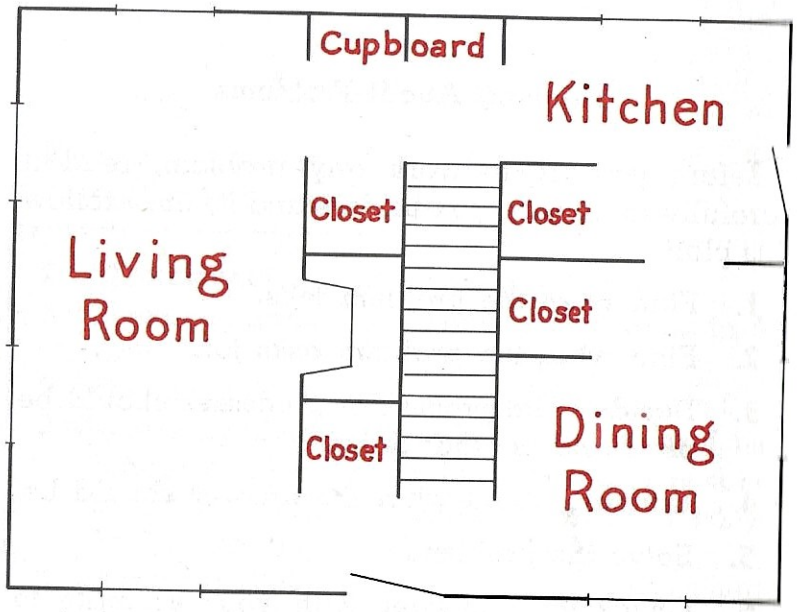
Use the plan in working these problems:

1. Three hundred and fifty gallons of aviation gas weighed 2100 lb. Find the weight per gallon.

2. Find the cost of 2 doz. napkins if 6 napkins cost $3.45.

3. Mr. Rankin works from 8 A.M. to 5 P.M., with one hour out for lunch. At $1.10 an hour, how much does he earn in 5 da.?

4. A commercial plane averages 300 miles per hour. Find to the nearest minute the time it would take to fly from Chicago to Denver, a distance of 910 miles.



Scale Drawing

Here is the floor plan of a house. The plan is drawn to a scale of 1″=9′. Measure each room and find its real size in feet.

Draw this same plan to a scale of 1″=6′.

You can work either of two ways:

1. 1″=9′ $4 \times 9' = 36'$ = width from given plan

1″=6′ $36 \div 6 = 6$, so the width on the new plan must be $6 \times 1'' = 6''$.

2. 1″=9′ in given plan

1″=6′ in new plan

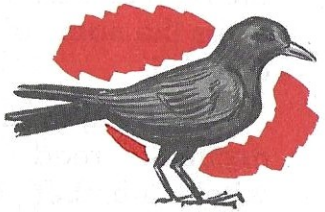
$9 \div 6 = 1\frac{1}{2}$, so each dimension in the new plan must be $1\frac{1}{2}$ times the corresponding dimension in the old plan.

Sometimes, very small objects are drawn to a scale several times larger than the objects. In this drawing of an elm beetle, the scale (×2) was used, which means that the measurements in the drawing are 2 times the actual measurements. Such a scale is called a **multiplication scale.**

Since each measurement in the drawing is 2 times the actual length, the actual length of the beetle is $\frac{1}{2}$ the length in the drawing.

1. Measure the length of the body of the elm beetle in the drawing, and find its actual length.

Fraction scales are often used in making drawings of large objects. This picture of a crow is drawn to a scale of $\frac{1}{12}$ the actual measurements of the crow.



Since each measurement in the drawing is $\frac{1}{12}$ the actual length, the actual height of the crow is 12 times the height in the drawing.

2. Measure the greatest height of the crow in the drawing. About what is the actual height of the crow?

3. Find in the dictionary pictures of animals and insects drawn to fraction and multiplication scales. Find and list the 2 real measurements.

More practice on page 385.

Recalling Decimals

In a whole number, each place value stands for ten times the value of the place to its right. 100 is 10 times 10. 10 is 10 times 1.

Then comes the decimal point, but the place value rule goes on just the same.

1 tenth (.1) is 10 times 1 hundredth (.01).

1 hundredth is 10 times 1 thousandth (.001).

1. Give the place value of each figure in this box.

Decimal Point	Tenths	Hundredths	Thousandths	Ten-thousandths	Hundred-thousandths	Millionths
.	8	3	2	4	5	7

The last place to the right in a decimal gives the name of the decimal.

In reading a mixed decimal, read the whole number and then the decimal. The decimal point is read **and.**

2. Read these decimals: .5, .008, .15, .3645, .723645, .0899, 3.0769, 85.0082, 7.235, 1.101.

3. Round each of these decimals to the nearest tenth, the nearest hundredth, and the nearest thousandth:

.2837 .0989 .1095 .5378

4. Tell which is larger and why.

.04 or .40 .275 or .269 .3456 or 3446

Working with Decimals

Adding and subtracting decimals is like adding and subtracting dollars and cents. The numbers are written with the decimal points one under the other, and the decimal point in the answer is placed under the other decimal points.

Should there be fewer decimal places in a minuend than in a subtrahend, enough zeros are written to the right of the minuend to make the same number of decimal places in both.

Adding and taking away zeros to the right of a decimal does not change its value.

Add and check.

	a	b	c	d
1.	4.739	799.98	5.25	18.181
	86.60	1.43	59.62	125.03
	3.894	288.4	560.56	9.9
	69.94	26.842	652.093	1320.231
	2.56	.69	86.86	762.05

Subtract and check.

2.	155.49	602.51	164.76	50.354
	66.307	63.82	65.487	40.481
3.	2203.56	2.8911	71.833	7485
	1454.1	1.1863	15.7571	1.273

4. If a speedometer shows 5260.5 miles at the start of a trip, and 5540.8 miles at the end, what was the length of the trip?

Making Up Problems

Read all these ideas. Choose five of them to make up problems of your own.

1. Finding how long it took some Boy Scouts to hike from one town to another at a certain rate an hour.

2. Using the fraction scale on an animal picture to find the animal's actual length.

3. Dividing a part of a cake among a few of your friends and finding what part each received.

4. Buying something marked down at a sale and finding how much you saved by the purchase.

5. Driving at a certain rate an hour for many miles and finding how many hours the trip took.

6. Paying for an order of six sports things listed in a mail-order catalog.

7. Finding what part of its games a baseball team won when you know how many games it lost and won.

8. Finding how long it takes for a train to go from one city to another when you know the hour and minute it left and arrived.

9. Using the multiplication scale on the picture of a fish to find its actual length.

Work your problems. Give your problems and work to your neighbor to correct. Then, correct your mistakes, if any.

Show that You Know

	Add	Subtract	Multiply	Divide
1.	98502 848 41634	61832 55224	4721 146	$62\overline{)13082}$ $71\overline{)7952}$
	827 68976	42045 26732	6389 287	$83\overline{)56357}$ $69\overline{)25668}$
2.	$397.53 963.78 1.56	$746.67 207.53	$98.63 758	$629\overline{)30821}$ $724\overline{)61540}$
	649.37 76.99	$967.48 418.06	$78.08 960	$191\overline{)90725}$ $706\overline{)66364}$
3.	4 ft. 9 in. 2 ft. 3 in.	6 yd. 1 ft. 3 yd. 2 ft.	2 lb. 3 oz. 41	$5\overline{)7 \text{ bu. } 1 \text{ qt.}}$
4.	7 bu. 2 pk. 3 bu. 3 pk.	9 gal. 1 qt. 8 gal. 3 qt.	9 T. 6 cwt. 12	$6\overline{)7 \text{ bu. } 1 \text{ pk.}}$
5.	$2\frac{2}{7}+3\frac{5}{14}$	$6\frac{4}{5}-3\frac{4}{7}$	$\frac{4}{5}\times\frac{2}{3}\times\frac{3}{4}$	$\frac{5}{6}\div 10$
6.	$5\frac{3}{4}+6\frac{5}{6}$	$11-3\frac{4}{5}$	$\frac{1}{9}\times\frac{3}{5}\times\frac{5}{6}$	$8\frac{1}{3}\div 2\frac{1}{2}$

Find the answers.

7. 7 is $\frac{1}{8}$ of ? 9 is $\frac{3}{4}$ of ? 50 is $\frac{5}{6}$ of ? 30 is $\frac{3}{100}$ of ?
8. What part of a bushel is: 12 qt.? 20 qt.?

Find the cost of:

9. 8 cakes of soap at $1.08 a dozen.
10. 18 handkerchiefs if 3 cost 50¢.

Multiplying Decimals

Be sure you remember these two important points about multiplying decimals:

In multiplying decimals, point off in the product as many decimal places as there are in both the multiplicand and the multiplier.

Sometimes it is necessary to write zeros right after the decimal point so as to make the needed number of decimal places.

$$.5 \times .005 = .0025$$

Multiply and check.

	a	b	c	d
1.	80.84	274.5	301.7	98.86
	2.4	.078	9.83	60.9
2.	30.68	564.19	101.51	4375.2
	8.75	.97	70.5	6.07
3.	997.6	2534.4	730.05	81230
	8.08	.09	1.02	.125

4. A car driven at the average rate of 45.15 miles an hour will go how far in 18 hours' driving?

5. A cross country race course is 5.25 miles long. Robert ran over the course 12 times. How far did he run?

6. Albert Robins earns 85¢ an hour. How much is he paid for a 40-hour week's work?

Decimals and 10, 100, and 1000

To multiply a decimal by 10, 100, and 1000, move the decimal point one place to the **right** for each zero in the multiplier.

To divide a decimal by 10, 100, and 1000, move the decimal point one place to the **left** for each zero in the divisor, inserting zeros if necessary.

Multiply by 10, 100, and 1000, the decimal way.

68	8.6	.5	.017	25.74

Divide by 10, 100, and 1000.

68	8.6	.5	.017	25.74

Of course, you can divide whole numbers by 10, 100, and 1000 the decimal way by simply placing a decimal point after the whole number before you begin to work.

$72. \div 10 = 7.2$ $\quad 72. \div 100 = .72$ $\quad 72. \div 1000 = .072$

Divide by 10, 100, 1000.

9	60	720	110	563

Missing Numbers to Supply

$$\begin{array}{r} 9\,6 \\ -\ 3\,1 \\ \hline 6849 \end{array} \qquad \begin{array}{r} 2\,3 \\ \times\ 25 \\ \hline 12655 \\ 50\,2 \\ \hline 63\,75 \end{array} \qquad 9\overline{)\,8\,0}\,98$$

Over the Phone

Jessie: Let's see — 9-9652. That's Trude's number. Hello, Trude, what have you been doing this morning?

Trude: Get out your pencil and I'll tell you. I woke up at 8:00 A.M. It took me $\frac{2}{3}$ of an hour to dress; $\frac{5}{12}$ of an hour for breakfast; $\frac{2}{5}$ of an hour to help with the dishes; $\frac{1}{4}$ of an hour to make my bed. Then I went to the grocery. This took $\frac{5}{6}$ of an hour. Have I lost you by this time?

Jessie: No! You have reported on _____min., and that would make it _____A.M.

(Give the missing numbers.)

Trude: Good for you. Now tell me what you have done this morning.

Jessie: It was 7:45 A.M. when I woke up. I read for $\frac{1}{4}$ of an hour less than the time you used in dressing. Even after that, $\frac{1}{12}$ of an hour passed before I was out of bed. I spent $\frac{5}{6}$ of an hour dressing, and my breakfast took twice as long as yours did. Then I read the comics for $\frac{1}{3}$ of an hour. And now listen! Next I phoned Patsy, and talked for .15 of an hour. Now I have talked to you for .2 of an hour. That should make it _____A.M. now. Oh, dear, I guess I wasted one minute!

How much time had Jessie really wasted?

Dividing Decimals by Whole Numbers

Study again each of these explanations. See how each is applied in the example beside it. Work the examples to be sure that the answers are right.

1. To divide a decimal by a whole number, place the decimal point in the quotient above the decimal point in the dividend and divide.

$$9\overline{)75.60} \quad 8.40$$

2. Carry every inexact division to at least three decimal places unless told not to. Place a + sign after the last figure in the quotient if the division is still uneven.

$$13\overline{)3.550} \quad .273+$$

3. In dividing a number by a larger number, place a decimal point after the dividend and divide, annexing zeros to the dividend as needed.

$$48\overline{)36.00} \quad .75$$

4. There must be a figure in each decimal place in the quotient. If there are vacant places between the decimal point and the first figure to the right of it, write a zero in each place.

$$17\overline{)1.054} \quad .062$$

Divide and prove.

$5\overline{)86.45}$ $25\overline{)12.}$ $21\overline{)1.56}$ $34\overline{)2.108}$

Dividing by Decimals

To divide by a decimal, first change the divisor to a whole number.

Divide 9 by .04.

Write a decimal point after the 9. Multiply both .04 and 9 by 100 by moving the decimal point two places to the right. Mark the new places by carets. Divide. Place the decimal point in the quotient over the caret in the divisor.

Divide and prove.

	a	b	c	d
1.	$7.6\overline{)71.9}$	$6.4\overline{)48.96}$	$.005\overline{)3000}$	$2.5\overline{)23.85}$
2.	$4.6\overline{)9.545}$	$.18\overline{)19476}$	$7.8\overline{)573.3}$	$.092\overline{).7792}$
3.	$.72\overline{)698.4}$	$.68\overline{)4.454}$	$1.7\overline{)47.58}$	$.084\overline{)47.20}$
4.	$9.35\overline{)50.219}$	$3.95\overline{)100.33}$	$9.98\overline{)121.1}$	$.184\overline{)1.8174}$

To check the place of the decimal found in your quotient, subtract the number of decimal places in the divisor from the number of decimal places in the dividend. The difference should equal the number of decimal places in the quotient.

5. A county had 3.67 miles of road built for $7,758. What was the average cost per mile?

6. A plane flew 3565 miles in 11.5 hours. Find its average speed per hour.

Making Sure About Decimals

Add.

	a	b	c	d
1.	22.	35.9	6.	.38
	14.04	75.8	68.32	67.
	90.3	7.912	6.3	90.635
	24.28	44.55	73.819	88.
	27.62	45.701	8.94	76.76
	45.79	3.46	56.851	9.659

Subtract.

2.	2.932	804.5	164.17	5938.3
	.914	105.1	48.2	293.9
3.	6.8363	96.17	582.	87.268
	.1285	49.747	198.32	59.478

Multiply.

4.	.639	4107	2574	54.18	40.35
	55	8.7	.069	.65	8.9
5.	792.2	2.809	.938	81.63	.0716
	.036	9.4	20.6	.079	43.5

Divide.

6.	$5.4\overline{)46.71}$	$85.7\overline{)76.82}$	$1.7\overline{)3.995}$	$.33\overline{)3.327}$
7.	$.058\overline{)55.97}$	$91.4\overline{)699.2}$	$4.76\overline{)52.122}$	$.41\overline{)411.23}$

Choose the reasonable answers; then work.

8.	$7.7 \div 2.2 = .35$	.035	3.5	35
9.	$3.44 \div 1.6 = 2.15$	21.5	.0215	215
10.	$63.8 \div 5.8 = .11$	.011	1.1	11

More practice on page 385.

Decimals and Fishing

1. You go fishing. You sit very still for 1.25 hour. Not a nibble. Then: a bite, a bass, and you have landed him! He weighs 1.5 lb. What did he pay per hour in pounds?

2. Another .5 of an hour and another catch. This time the fish weighs 2. lb. How many pounds of fish per hour have you to show for 1.75 hour's patience now?

3. Another .75 of an hour of fishing would be how long all together? Another 1.5 lb. fish would be how many pounds all together? How many pounds per hour have you averaged now?

Fractions and Decimals

Study this decimal changed to a fraction, and explain how the answer was found.

$$.33\tfrac{1}{3} = \frac{33\frac{1}{3}}{100} = 33\tfrac{1}{3} \div 100 = \frac{\overset{1}{\cancel{100}}}{3} \times \frac{1}{\underset{1}{\cancel{100}}} = \frac{1}{3}$$

Change to fractions.

1. .75 $.66\frac{2}{3}$ $.16\frac{2}{3}$ $.87\frac{1}{2}$ $.37\frac{1}{2}$

Write the directions for changing a decimal to a fraction.

Study these fractions changed to decimals, and explain how each answer was found.

$\frac{3}{4} = 4\overline{)3.00}$ .75

$\frac{1}{8} = 8\overline{)1.00}$ $.12\frac{1}{2}$

$\frac{1}{12} = 12\overline{)1.00}$ $.08\frac{1}{3}$

Change to decimals.

2. $\frac{2}{5}$ $\frac{5}{6}$ $\frac{3}{8}$ $\frac{1}{20}$ $\frac{1}{9}$

Write the directions for changing a fraction to a decimal.

Do the examples you have just studied and worked help you to understand and remember this table of equivalents?

$50¢ = \frac{1}{2}$ of \$1
$25¢ = \frac{1}{4}$ of \$1
$75¢ = \frac{3}{4}$ of \$1
$33\frac{1}{3}¢ = \frac{1}{3}$ of \$1
$66\frac{2}{3}¢ = \frac{2}{3}$ of \$1
$20¢ = \frac{1}{5}$ of \$1
$40¢ = \frac{2}{5}$ of \$1
$60¢ = \frac{3}{5}$ of \$1

$16\frac{2}{3}¢ = \frac{1}{6}$ of \$1
$83\frac{1}{3}¢ = \frac{5}{6}$ of \$1
$12\frac{1}{2}¢ = \frac{1}{8}$ of \$1
$37\frac{1}{2}¢ = \frac{3}{8}$ of \$1
$62\frac{1}{2}¢ = \frac{5}{8}$ of \$1
$87\frac{1}{2}¢ = \frac{7}{8}$ of \$1
$10¢ = \frac{1}{10}$ of \$1
$5¢ = \frac{1}{20}$ of \$1

Without a Pencil

Try to work these problems without using a pencil and paper. Write only the answers. If you cannot do a problem in your mind, work it on paper.

1. What fraction of a pound is 10 oz.?
2. Which is larger, .0175 or .025?
3. 24 is $\frac{3}{5}$ of what number?
4. Find the product of .5 and .05.
5. Write $\frac{3}{8}$ as a decimal.
6. Divide 8 by .4.
7. From the sum of $\frac{1}{2}$ and $\frac{1}{4}$, subtract $\frac{3}{8}$.
8. To the product of 8 and 4, add the sum of 4 and 8.
9. If the sum of the weights of 5 people is 725 lb., what is the average weight of each person?
10. Each week at school, Irving has 135 min. of shop work. How much time, in hours and minutes, does he spend in this work?
11. A plane which has a cruising speed of 300 miles per hour flies how many miles a min.?
12. Dave worked from 8:30 A.M. until 12 noon and received 75¢ an hour. How much did he earn?
13. Is 285 most nearly $\frac{1}{2}$ of 800, $\frac{1}{4}$ of 800, or $\frac{3}{8}$ of 800?

A Story for You to Write

Here is a bill. Write a story telling who sent it, to whom, and for what. Write every fact the bill gives you.

THE ALAMO SPORTS SHOP
Dallas, Texas

June 1

Sold To: Mr. Henry Rogers
81 Park St., Sherman, Texas

Date	Items	Charge
May 3	1 Tennis Racket	$12.50
May 3	3 Tennis Balls	2.25
May 10	1 pr. Tennis Shoes	4.75

Here is a check. Who wrote it, and what six facts does it

IROQUOIS, NEW YORK. June 20 19

THE IROQUOIS NATIONAL BANK

PAY TO THE ORDER OF Alamo Sports Shop $19

Nineteen and 50/100 ——————

NO. 435 Henry Rogers

Here is a deposit slip. What facts does it add to your story?

DEPOSITED IN
THE IROQUOIS TRUST COMPANY
TO THE CREDIT OF Aug

NAME: Henry Rogers
Sherman, Texas

BILLS		
SILVER		
CHECKS		393

Here is a page from a bank book. Tell how it fits into your story.

Depositor Henry Rogers

Date	Withdrawal	Deposit	Interest	Balance
		385.00		2140.75
			10.00	2150.75
	19.50			2131.25

Here are some entries in a cash account. What do they add to your story?

RECEIPTS		EXPENDITURES	
		June 1 Rent	75 00
		June 3 Groceries	90 00
		June 7 Insurance	22 58
		June 12 Shoes	8 95
		June 21 Charities	15 00
		June 29 Auto trip	55 00
On hand July 1	72 07	On hand June 30	72 07
Total	338 60	Total	338 60

Another Way to Check Multiplication

Multiply 258×947.

947 — $9+4+7=20$. — $2+0=2$.
258 — $2+5+8=15$. — $1+5=6$.
7576
4735
1894
244326 — Add $2+4+4+3+2+6=21$. $2+1=3$.

When you have all three rows, multiplicand, multiplier, product, added into one number each, just multiply $6 \times 2 = 12$. Make 12 into one number by adding $1+2=3$. The number should be the same number your first product added up to.

The important thing to remember is to keep on adding until you reduce each answer to one figure. Then the product of the first two figures, reduced to one figure, should equal the third figure.

Let's try one more to be sure.

865 — $8+6+5=19$ — $1+9=10$ — $1+0=1$
943 — $9+4+3=16$ — $1+6=7$
2595
3460 — $7 \times 1 = 7$
7785
815695 — $8+1+5+6+9+5=34$ — $3+4=7$

Work these examples and check them the new way:

	a	b	c	d
1.	142×248	352×769	504×791	129×440
2.	253×584	672×859	455×765	387×998

Testing Your Progress

1. 8.506
.359
9.007
.7627
3.038
.8197

2. What is the difference between 8.745 and .764?

3. Find the product of 42.46 and .479.

4. $11\frac{5}{8} + \frac{5}{8} = ?$

5. Divide 414.18 by 17.7.

6. Add $72\frac{5}{8}$, $26\frac{3}{4}$, 189, $379\frac{1}{2}$.

8. $1\frac{2}{3} \times \frac{9}{10} \times \frac{2}{3} = ?$

7. Multiply 79.4 by 5.07.

9. $161\frac{3}{4} - 67\frac{7}{8} = ?$

10. Find the flying time in hours if 470 miles are [illegible] at 280 miles per hour.

11. Last term, 36 of the 40 pupils in our class were promoted. Find the ratio of the number of pupils promoted to the number who were not.

12. Six clerks in a store earn weekly salaries of [illegible], $27.50, $28, $30, and $21.50. Find the average wage.

13. A science class noted the following temperatures one June day: 6 A.M., 58°; 9 A.M., 62°; 12 [illegible], 70°; 3 P.M., 82°; 6 P.M., 65°. Show this information by a line graph.

14. On Monday, Wednesday, Thursday, and Friday, Tom works from 8 A.M. to 5 P.M., with 1 hr. [illegible] for lunch. Tuesday morning, he goes to part-time school, and works from 1 P.M. to 5 P.M. Saturday he works from 9 A.M. to 12 M. Find his weekly wages if he is paid 85¢ an hour.

THIS BOOK IS PRESENTED TO YOUR
SCHOOL SYSTEM FOR EXAMINATION BY
SUPERVISORS AND TEACHERS.

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